

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

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In re Application of: : Examiner: John A. Hevey
: :
Heike SCHLUCKWERDER et al. :
: :
For: GLASS-CERMAIC COMPOSITE :
MATERIAL, CERAMIC :
SUBSTRATE LAMINATE OR :
MICROHYBRID HAVING THIS :
COMPOSITE AND A METHOD :
FOR PRODUCING IT :
: Art Unit: 1709
Filed: August 30, 2005 :
: :
Serial No.: 10/523,251 :
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Signature: /Elizabeth Tretter/
Elizabeth Tretter

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

SIR:

On July 16, 2008, Appellants filed a Notice of Appeal from the last decision of the Examiner contained in the Final Office Action dated March 18, 2008 in the above-identified patent application. The Notice of Appeal was received by the United States Patent and Trademark Office on the same day, July 16, 2008, so that the two-month appeal brief due date is September 16, 2008.

In accordance with 37 C.F.R. § 41.37, this brief is submitted in support of the appeal of the rejections of claims 15 to 36. For at least the reasons set forth below, the final rejections of claims 15 to 36 should be reversed.

1. REAL PARTY IN INTEREST

The real party in interest in the present appeal is ROBERT BOSCH GMBH of Stuttgart in the Federal Republic of Germany, which is the assignee of the entire right, title and interest in and to the present application.

2. RELATED APPEALS AND INTERFERENCES

There are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, "which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal."

3. STATUS OF CLAIMS

Claims 1 to 14 have been canceled.

Claims 15 to 36 are pending.

Claims 15 and 22 to 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Japanese Publication No. 11-292616 (Ayako") and U.S. Patent No. 6,054,220 ("Mroz").

Claims 29 to 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of U.S. Patent No, 4,821,142 ("Ushifusa") and Mroz.

Claims 16 to 21 stand rejected under 35 U.S.C § 103(a) as unpatentable over the combination of Ayako, Mroz and U.S. Patent No. 6,514,890 ("Nagata").

A copy of the appealed claims, *i.e.*, claims 15 to 36, is attached hereto in the Claims Appendix.

4. STATUS OF AMENDMENTS

In response to the Final Office Action dated March 18, 2008, Appellants submitted a "Reply Under 37 C.F.R. § 1.116" on May 21, 2008. The Reply did not include any proposed amendments to the claims. It is Appellants' understanding that the claims as included in the annexed "Claims Appendix" reflect the current claims.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 15 is directed to a glass-ceramic composite material comprising a glass-type matrix including lithium, silicon, aluminum and oxygen and at least partly in a crystalline phase, and a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %. *Specification*, page 3, lines 4 to 17; page 5, lines 27 to 30.

Independent claim 29 is directed to a ceramic foil, ceramic laminate or microhybrid, comprising a glass-ceramic composite material comprising at least from place

to place a glass-type matrix and a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %, wherein the matrix contains lithium, silicon, aluminum and oxygen, and has at least from place to place at least one crystalline phase. *Specification*, page 2, lines 30 to 32; page 3, lines 4 to 17; page 5, lines 27 to 30.

Independent claim 30 recites a method for producing a glass-ceramic composite material, a ceramic foil, a ceramic laminate or a microhybrid. Claim 30 recites that the method includes melting a glass having crystalline regions from a starting mixture having 20 wt. % to 68 wt. % SiO₂, 10 wt. % to 25 wt. % Al₂O₃, 5 wt. % to 20 wt. % Li₂O, 0 wt. % to 35 wt. % B₂O₃, 0 wt. % to 10 % P₂O₅, 0 wt. % to 10 wt. % Sb₂O₃ and 0 wt. % to 3 wt. % ZrO₂. *Specification*, page 4, line 29 to page 5, line 9. Claim 30 further recites converting the glass into a glass powder, mixing a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. % in with the glass powder, and sintering the powder mixture. *Specification*, page 3, lines 11 to 17; page 6, lines 4 to 13; page 7, lines 29 to 34.

6. GROUND S OF REJECTION TO BE REVIEWED ON APPEAL

- A. Whether claims 15 and 22 to 28 are patentable under 35 U.S.C. § 103(a) over the combination of Ayako and Mroz.
- B. Whether claims 29 to 36 are patentable under 35 U.S.C. § 103(a) over the combination of Ushifusa and Mroz.
- C. Whether claims 16 to 21 are patentable under 35 U.S.C. § 103(a) over the combination of Ayako, Mroz and Nagata.

7. ARGUMENT

A. Rejection of Claims 15 and 22 to 28 Under 35 U.S.C. § 103(a)

Claims 15 and 22 to 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Ayako and Mroz. It is respectfully submitted that the present rejection should be reversed for at least the following reasons.

I. Claims 15, 22 to 25 and 28

As set forth above, independent claim 15 is directed to a glass-ceramic composite material comprising a glass-type matrix including lithium, silicon, aluminum and oxygen and at least partly in a crystalline phase, and a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %. The Examiner has conceded that Ayako is silent as to the oxygen content of a ceramic filler. The Examiner, in the Final Office Action, has relied on Mroz, at column 2, lines 13 to 35, in combination with Ayako, as disclosing this feature of

claim 15. Mroz, however, cannot be said to disclose or suggest this feature of claim 15. Mroz, for example, at column 2, lines 36 to 46, describes the silica coated AlN powders as insufficient for the rigors of mechanical processing. Silica coated AlN powders, as described, break down during processing, since these powders do not exhibit satisfactory damage tolerance. Further, Mroz describes problems with hydrolysis stability, leading to weight gain.

Applicants respectfully submit that a person of ordinary skill in the art would not combine Ayako with the silica coated AlN powders of Mroz, due to this weakness and insufficiency for mechanical processing. Because Mroz specifically teaches away from the use of such powders, the combination of Ayako and Mroz does not disclose, or even suggest the features of claim 15.

Further, even if one were to combine Ayako and Mroz, the oxygen content range of the AlN powder of Mroz is not the same and does not apparently overlap the range featured in claim 15. Regarding an oxygen content range, Mroz states that at col. 2, lines 18 to 22 that “[t]he physical characteristics determined for silica coated AlN powders in particular including coating thickness of 300-400 nm, oxygen contents in the 2-4% range, and surface area ranging from 8-12 m²/g.” Contrary to the assertions contained in the Final Office Action, Mroz merely refers to a “2-4% range” not a weight percent range. Thus, the contention that Mroz discloses a range that overlaps the claimed range is not supported by the statement appearing at col. 2, lines 18 to 22 of Mroz.

Claims 22 to 25 and 28 depend from claim 15 and therefore include all of the features of claim 15. As more fully set forth above with respect to claim 15, the combination of Ayako and Mroz does not disclose or suggest all of the features of claim 15. As such, the combination of Ayako and Mroz does not render unpatentable claims 22 to 25 and 28 for at least the same reasons as those of claim 15.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

II. Claims 26 and 27

As an initial matter, claims 26 and 27 depend from claim 15 and therefore incorporate all of the features of claim 15. As explained above, the combination of Ayako and Mroz does not render unpatentable claim 15, from which claims 26 and 27 depend. Therefore, it is respectfully submitted that the combination of Ayako and Mroz does not anticipate claims 26 and 27 for at least the same reasons as claim 15.

Claims 26 and 27 are further directed to a proportion of ceramic filler in the composite material, the proportion measured in volume percentage. The Final Office Action refers to Ayako as disclosing this claimed feature. While the Final Office Action admits that Ayako refers to weight percentage ranges and not volume percentage ranges, the Final Office Action asserts that it is believed that the ranges would overlap. No evidence is shown that the weight percentages would overlap, beyond this unsupported presumption. Without such a showing, Appellants do not believe that such a rejection is proper. Ayako does not disclose or suggest the volume proportions of the ceramic filler, and therefore does not render unpatentable claims 26 and 27.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

B. Rejection of Claims 29 to 36 Under 35 U.S.C. § 103(a)

Claims 29 to 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Ushifusa and Mroz. It is respectfully submitted that the present rejection should be reversed for at least the following reasons.

As set forth above, independent claim 29 is directed to a ceramic foil, ceramic laminate or microhybrid, comprising a glass-ceramic composite material comprising at least from place to place a glass-type matrix and a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %, wherein the matrix contains lithium, silicon, aluminum and oxygen, and has at least from place to place at least one crystalline phase. The Final Office Action concedes, as in the rejection of claim 15, that Ushifusa is silent as to the oxygen content of a ceramic filler, and relies on Mroz as disclosing this feature. For at least the same reasons as set forth above with respect to claim 15, Mroz teaches away from the features of claim 29, and therefore the combination of Ushifusa and Mroz does not render unpatentable claim 29.

As set forth above, independent claim 30 recites a method for producing a glass-ceramic composite material, a ceramic foil, a ceramic laminate or a microhybrid, the method including the step of converting the glass into a glass powder, mixing a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. % in with the glass powder, and sintering the powder mixture. For at least the same reasons as stated above with respect to claims 15 and 29, the combination of Ushifusa and Mroz does not render unpatentable claim 30.

Claims 31 to 36 depend from claim 30 and therefore incorporate all of the features of claim 30. As more fully set forth above, the combination of Ushifusa and Mroz does not disclose or suggest all of the features of claim 30. As such, the combination of

Ushifusa and Mroz does not render unpatentable claims 31 to 36 for at least the same reasons as those of claim 30.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

C. Rejection of Claims 16 to 21 Under 35 U.S.C. § 103(a)

Claims 16 to 21 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Ayako, Mroz and Nagata. It is respectfully submitted that the present rejection should be reversed for at least the following reasons.

Claims 16 to 21 depend from claim 15 and therefore incorporate all of the features of claim 15. As more fully set forth above, the combination of Ayako and Mroz does not disclose or suggest all of the features of claim 15. Nagata does not cure, nor is it cited to cure, the critical deficiencies of the primary references. As such, the combination of Ayako, Mroz and Nagata does not render unpatentable claims 16 to 21 for at least the same reasons as those of claim 15.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

8. CLAIMS APPENDIX

A "Claims Appendix" is attached hereto and appears on the three (3) pages numbered "Claims Appendix 1" to "Claims Appendix 3."

9. EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§ 1.130, 1.131 or 1.132. No other evidence has been entered by the Examiner or relied upon by Appellants in the appeal. An "Evidence Appendix" is nevertheless attached hereto and appears on the one (1) page numbered "Evidence Appendix."

10. RELATED PROCEEDINGS APPENDIX

As indicated above in Section 2, above, "[t]here are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, 'which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.'" As such, there no "decisions rendered by a court or the Board in any proceeding identified pursuant to [37 C.F.R. § 41.37(c)(1)(ii)]" to be submitted.

A "Related Proceedings Appendix" is nevertheless attached hereto and appears on the one (1) page numbered "Related Proceedings Appendix."

11. **CONCLUSION**

For at least the reasons indicated above, Appellants respectfully submit that the art of record does not disclose or suggest the subject matter as recited in the claims of the above-identified application. Accordingly, it is respectfully submitted that the subject matter as set forth in the claims of the present application is patentable.

In view of all of the foregoing, reversal of all of the rejections set forth in the Final Office Action is therefore respectfully requested.

Respectfully submitted,

Dated: September 16, 2008

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CLAIMS APPENDIX

15. A glass-ceramic composite material comprising
a glass-type matrix including lithium, silicon, aluminum and oxygen and at least partly in a crystalline phase; and
a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %.
16. The glass-ceramic composite material as recited in claim 15, wherein the matrix contains 20 wt. % to 68 wt. % SiO_2 , 10 wt. % to 25 wt. % Al_2O_3 , 5 wt. % to 25 wt. % Li_2O , 0 wt. % to 35 wt. % B_2O_3 , 0 wt. % to 10 % P_2O_5 , 0 wt. % to 10 wt. % Sb_2O_3 and 0 wt. % to 3 wt. % ZrO_2 .
17. The glass-ceramic composite material as recited in claim 15, wherein the matrix is melted from a starting mixture that contains or is made of 20 wt. % to 68 wt. % SiO_2 , 10 wt. % to 25 wt. % Al_2O_3 , 5 wt. % to 25 wt. % Li_2O , 0 wt. % to 35 wt. % B_2O_3 , 0 wt. % to 10 % P_2O_5 , 0 wt. % to 10 wt. % Sb_2O_3 and 0 wt. % to 3 wt. % ZrO_2 .
18. The glass-ceramic composite material as recited in claim 16, wherein the matrix contains 48 wt. % to 66 at % SiO_2 , 14 wt. % to 22 wt. % Al_2O_3 , 4 wt. % to 20 wt. % Li_2O , 0 wt. % to 20 wt. % B_2O_3 , 0 wt. % to 5 % P_2O_5 , 0 wt. % to 5 wt. % Sb_2O_3 and 0 wt. % to 2 wt. % ZrO_2 .
19. The glass-ceramic composite material as recited in claim 17, wherein the starting mixture contains or is made of 48 wt. % to 66 at % SiO_2 , 14 wt. % to 22 wt. % Al_2O_3 , 4 wt. % to 20 wt. % Li_2O , 0 wt. % to 20 wt. % B_2O_3 , 0 wt. % to 5 % P_2O_5 , 0 wt. % to 5 wt. % Sb_2O_3 and 0 wt. % to 2 wt. % ZrO_2 .
20. The glass-ceramic composite material as recited in claim 16, wherein the matrix contains at least one of 3 wt. % to 33 wt. % B_2O_3 , 2 wt. % to 5 wt. % P_2O_5 , 1 wt. % to 5 wt. % Sb_2O_3 , and 1 wt. % to 2 wt. % ZrO_2 .
21. The glass-ceramic composite material as recited in claim 17, wherein the starting mixture contains at least one of 3 wt. % to 33 wt. % B_2O_3 , 2 wt. % to 5 wt. % P_2O_5 , 1 wt. % to 5 wt. % Sb_2O_3 , and 1 wt. % to 2 wt. % ZrO_2 .
22. The glass-ceramic composite material as recited in claim 15, wherein the ceramic filler is aluminum nitride having an average particle size of 100 nm to 10 μm .

23. The glass-ceramic composite material as recited in claim 22, wherein the ceramic filler has a coating.

24. The glass-ceramic composite material as recited in claim 15, wherein the matrix has, as a crystalline phase, at least one of an $\text{LiAlSi}_2\text{O}_3$ mixed crystal, an Li-Al-Si oxynitride, an Li-Al silicate, an Li silicate, and an Li-B oxide.

25. The glass-ceramic composite material as recited in claim 15, wherein the matrix has a residual glass phase in which nitrogen is soluble in a small proportion.

26. The glass-ceramic composite material as recited in claim 15, wherein a proportion of ceramic fillers in the composite material is between 25 vol. % and 60 vol. %.

27. The glass-ceramic composite material as recited in claim 26, wherein the proportion is between 30 vol. % and 50 vol. %.

28. The glass-ceramic composite material as recited in claim 15, wherein the composite material has a heat conductivity of 8 W/mK to 12 W/mK.

29. A ceramic foil, ceramic laminate or microhybrid, comprising:
a glass-ceramic composite material comprising at least from place to place a glass-type matrix and a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. %, wherein the matrix contains lithium, silicon, aluminum and oxygen, and has at least from place to place at least one crystalline phase.

30. A method for producing a glass-ceramic composite material, a ceramic foil, a ceramic laminate or a microhybrid, comprising:

melting a glass having crystalline regions from a starting mixture having 20 wt. % to 68 wt. % SiO_2 , 10 wt. % to 25 wt. % Al_2O_3 , 5 wt. % to 20 wt. % Li_2O , 0 wt. % to 35 wt. % B_2O_3 , 0 wt. % to 10 % P_2O_5 , 0 wt. % to 10 wt. % Sb_2O_3 and 0 wt. % to 3 wt. % ZrO_2 ;

converting the glass to a glass powder;

mixing a ceramic filler having an oxygen content of 0.5 wt. % to 2.0 wt. % in with the glass powder; and

sintering the powder mixture.

31. The method as recited in claim 30, wherein the ceramic filler is powdered aluminum nitride.

32. The method as recited in claim 31, wherein the powder mixture is sintered.

33. The method as recited in claim 32, wherein the powder mixture is pressed before the sintering.

34. The method as recited in claim 32, wherein before the sintering, the powder mixture is formed to a foil, layer or laminate.

35. The method as recited in claim 30, wherein the sintering is performed at a temperature of at most 1050⁰ C in one of air, nitrogen, or a gas mixture containing at least one of oxygen and nitrogen.

36. The method as recited in claim 30, wherein the powder mixture is prepared before the sintering in a solvent while adding a dispersing agent, and an organic binder is added.

EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§1.130, 1.131, or 1.132. No other evidence has been entered by the Examiner or relied upon by Appellants in the appeal.

RELATED PROCEEDINGS APPENDIX

As indicated above in Section 2 of this Appeal Brief, “[t]here are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, ‘which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.’” As such, there no “decisions rendered by a court or the Board in any proceeding identified pursuant to [37 C.F.R. § 41.37(c)(1)(ii)]” to be submitted.